CLAIMS

We claim:

1. A method for steering an antenna beam using a periodic resonance structure, comprising the steps of:

electrically and magnetically coupling a first fluid dielectric to a plurality of transmission line stubs that are respectively coupled to a plurality of radiating elements of a periodic resonance structure; and

controlling said first fluid dielectric to selectively vary an electrical length of said plurality of transmission line stubs, whereby an angle can be controlled for a redirected RF beam produced by an incident RF signal impinging on said periodic resonance.

2. The method according to claim 1 wherein said controlling step further comprises the step of varying a volume of said first fluid dielectric coupled to said transmission line stubs to control an electrical length of said plurality of transmission line stubs.

3. The method according to claim 2 wherein said step of selectively varying said volume includes pumping a fluid dielectric into and out of a cavity structure positioned adjacent to said transmission line stub.

4. The method according to claim 2 further comprising the step of independently varying said volume of said first fluid dielectric coupled to each of

said plurality of transmission line stubs to control said angle of said redirected RF beam.

5. The method according to claim 2 wherein said step of varying said volume further comprises displacing with said first fluid dielectric a gas contained in said cavity structure.

6. The method according to claim 2 wherein said step of varying said volume further comprises displacing with said first fluid dielectric a second fluid dielectric also contained within said cavity structure.

7. The method according to claim 6 further comprising the step of selecting said first and second fluid dielectrics to be immiscible.

8. The method according to claim 1 wherein said step of selectively controlling said fluid dielectric further comprises controlling a presence or removal of a volume of said first fluid dielectric from a plurality of cavity structures respectively coupled to said plurality of transmission line stubs for controlling an electrical length of said plurality of transmission line stubs.

9. A steerable beam antenna comprising:

a periodic resonance structure comprising a plurality of transmission line stubs respectively coupled to a plurality of radiating elements;

a plurality of cavity structures each containing at least a first fluid dielectric, said first fluid dielectric electrically and magnetically coupled to said transmission line stubs; and

at least one fluid processor controlling said fluid dielectric for selectively varying an electrical length of said transmission line stubs, whereby an angle of a redirected RF beam produced by an incident RF signal impinging on said periodic resonance structure can be controlled.

10. The steerable beam antenna according to claim 9 wherein said fluid processor comprises a controller and at least one pump for controlling a volume of said first fluid dielectric in said cavity structures to vary an electrical length of said plurality of transmission line stubs.

11. The steerable beam antenna according to claim 10 wherein said first fluid dielectric displaces a gas in said cavity structures.

12. The steerable beam antenna according to claim 10 wherein said first fluid dielectric displaces a second fluid dielectric in said cavity structure.

13. The steerable beam antenna according to claim 12 wherein said first and second fluid dielectrics are immiscible.

14. The steerable beam antenna according to claim 13 wherein an immiscible fluid interface separates the first and second fluid dielectrics.

15. The steerable beam antenna according to claim 9 wherein said fluid processor controls said first fluid dielectric by independently increasing and decreasing a volume of said first fluid dielectric contained in said plurality of cavity structures respectively coupled to said plurality of transmission line stubs.

16. The steerable beam antenna according to claim 9 wherein said periodic resonance structure is an array of patch antennas.